## REMARKS / ARGUMENTS

The action by the Examiner in this application, together with the references cited by him have been given careful consideration. Following such consideration, claims 18, 23, 24, 27, 30, 31 and 35 have been amended, and new claims 36-48 have been added to define more clearly the patentable invention Applicant's believe is disclosed herein. It is respectfully requested that the Examiner reconsider the claims in their present form, together with the following comments, and allow the application.

As the Examiner well knows, the present invention relates to a component for use in forming a printed wiring board. One step in forming a printed wiring board is a laminating process wherein one side of the component is laminated to a substrate, such as an epoxy pre-preg, at high temperatures. In this respect, a laminating temperature typically exceeds 250°F and may exceed 400°F or 500°F. A component according to the present invention is comprised of a metal carrier substrate having a separation facilitating layer formed thereon. A vapor-deposited layer of copper is formed on the separation facilitating layer. A layer of electrodeposited copper is then formed on the vapor-deposited layer of copper. It is the vapor-deposited layer of copper and the electrodeposited layer of copper that are ultimately bonded to the epoxy pre-preg during the lamination process. Once bonded to the pre-preg, the metal carrier substrate is separated from the copper layers along the separation facilitating layer.

As indicated in the specification, the vapor-deposited layer of copper acts as a protective layer for the "separation facilitating layer" during the electrodeposition process wherein the

thicker, outer layer of copper is electrodeposited onto the vapor-deposited layer of copper. Electrodeposition of copper typically takes place in an acid plating solution that would dissolve the separation facilitating layer if it were not protected by the thin, vapor-deposited layer of copper that is on the separation facilitating layer. As indicated in the specification, the vapor-deposited copper layer has a thickness in a range of 50 Å to 10,000 Å. The electrodeposited layer of copper on the component has a thickness of about 1 μm to 35 μm.

In summary, the component according to the present invention has a very thin vapor-deposited layer of copper (i.e., 50 Å to 10,000 Å) with a thicker layer of electrodeposited copper (1 μm to 35 μm) thereon. It is respectfully submitted that none of the cited references alone or together teaches, suggests or shows the invention as presently claimed.

In response to the Examiner's rejections, claim 18 has been amended to define a carrier substrate as being "metal," and to define the thickness of the vapor-deposited layer of copper as being "in a range of 50 Å to 10,000 Å" and the thickness of the electrodeposited layer being in "a range of 1 μm to 35 μm."

Newly added claim 36 defines a component for use in forming a printed wiring board having a "copper substrate" and an "inorganic separation facilitating layer" on the copper substrate.

Newly added claim 43 defines a component for use in forming a printed wiring board comprising a "metal carrier substrate" having a "separation facilitating layer" formed of a "metallic oxide" thereon. The separation facilitating layer has a thickness in the range of 5 Å to 1,000 Å.

The claims stand rejected under 35 U.S.C. Section 102 as being anticipated by U.S. Patent No. 6,007,652 to Hosokawa et al. and U.S. Patent No. 6,319,620 to Kataoka et al.

The '652 to Hosokawa et al. relates to a method of preparing a metal thin film for forming an internal cathode of a multi-layered ceramic capacitor. Broadly stated, the '652 patent teaches forming a metal on polymer component. In one respect, the '652 patent is distinguishable from the amended claims since the amended claims now define a metal carrier substrate. In this respect, one would not look to the '652 patent in that it does not address the problems confronted in forming a metal-on-metal component, wherein a metal support substrate will separate from the metal layer(s) formed thereon. In this respect, the '652 patent discloses vapor-depositing a thin, metal film onto a polymer substrate. The patent indicates that the polymer film may be "coated with silicon in order to further improve transferability of a metal thin film to be formed." (See column 3, lines 52-53). The '652 patent does not specifically teach how the silicon is applied onto the polymer layer. As the Examiner notes, the '652 patent teaches vapor-depositing copper onto the polymer film and then electroplating copper onto the polymer film.

Applicants respectfully submit that the disclosure of the '652 patent does not teach, suggest or show a component as set forth in the claims. Foremost, as noted above, those skilled in the art would not look to the '652 patent to teach how to apply copper onto a metal substrate such that the copper could be separated from the metal substrate. In this respect, there are significantly different problems associated with separating metal from a polymer as compared to separating a metal layer from another metal layer. In this respect, the '652 patent itself recognizes that metal-on-polymer is easy to separate. See column 6, lines 40-44, that states:

> "when the film itself is formed of a material which essentially has small adhesion with respect to a metal, it is not necessary to perform surface treatment for improving transferability."

The foregoing statement indicates that the silicon layer that is applied to the polymer to further improve transferability of a metal thin film may not be required.

Moreover, although the '652 patent suggests that a metal substrate may be used instead of a polymer substrate, there is no teaching how to provide a separation facilitating layer on a metal substrate. In this respect, the only teaching in the '652 patent is with respect to a silicon layer. Applicants respectfully submit that if silicon was applied to a metal substrate, and then a metal was vapor-deposited onto the metal substrate, the metal layers would not separate. The silicon layer would not provide a separation surface between the metal layers. Accordingly, notwithstanding suggestions in the '652 patent that a metal substrate could be used in place of a polymer substrate, there is nothing in the teachings of the '652 patent that teaches one skilled in the art *how* to form a vapor-deposited layer *and* an electrodeposited layer of copper onto a metal substrate, so as to be able to separate the same.

In this respect, Applicants wish to point out comments found in the '620 patent to Kataoka et al., wherein the patentee noted that when a composite foil is laminated to a substrate, such as an epoxy pre-preg at high temperatures, "it becomes difficult to peel off a carrier layer." (See column 2, lines 16-17 of the '620 patent). In the foregoing quote, the patentee of the '620 patent was referring to the difficulty of separating a metal carrier layer from a copper layer formed thereon.

In summary, Applicants respectfully submit that the '652 patent does not teach (1) a metal carrier substrate having a separation facilitating layer thereon, (2) a vapor-deposited layer

of copper on the separation facilitating layer and (3) an electrodeposited layer of copper on the vapor-deposited layer of copper. It is respectfully submitted that there is nothing in the teachings of the '652 patent that teaches one skilled in the art how to apply layers of copper onto a metal carrier substrate in a manner that would allow the layers of copper to be separated from the metal carrier substrate.

The claims also stand rejected under the '620 patent to Kataoka et al. The '620 patent discloses making and using an ultra-thin copper foil by electrodepositing a foil layer onto a metal carrier substrate. An organic release layer is disposed between the electrodeposited, ultra-thin copper foil layer and the metallic carrier layer. The "ultra-thin copper foil layer" that is electrodeposited onto the metal carrier layer is deposited in two (2) separate copper plating steps. In this respect, the '620 patent recognizes that copper cannot be electrodeposited onto a release layer in an acidic bath because the acid in the bath would remove the thin release layer. Accordingly, in the '620 patent, a first copper plating step is performed in a copper pyrophosphate bath to apply a thin *electrodeposited* layer of copper onto the release layer. The layer of copper electrodeposited by this first copper-plating step is the protective layer of copper that protects the release layer and allows the subsequent plating of a thicker layer of copper onto the component in an acidic, copper-sulfate-plating bath. Thus, the '620 patent does <u>not</u> teach vapor-depositing a protective layer of copper onto a release layer, but rather, teaches electroplating a protective layer of copper onto a release layer, and then following such plating step by a second electrodeposition process.

Thus, the structure disclosed in the '620 patent is a metal carrier substrate having a release thereon, a first thin layer of electroplated copper (plated in a pyrophosphate plating

solution) on the release layer, and a thicker, electrodeposited, second layer of copper on the first, electroplated layer of copper. Accordingly, the resulting structure is unlike the components set forth in the present claims. The present claims define a metal carrier substrate having a release layer thereon, a *vapor-deposited* thin layer of copper is provided on the release layer, and an electroplated thicker layer of copper is provided on the vapor-deposited layer of copper.

The Examiner takes the position that the '620 patent teaches an electrodeposited layer of copper on the vapor-deposited layer. The Examiner refers to column 4, lines 19-24 of the '620 patent. Applicants acknowledge that the patent indicates that the "ultra-thin copper foil layer" may be formed by vapor deposition. However, the patentee of the '620 patent when making these comments was referring to a copper foil layer of about 12 μm, and more specifically, about 5 to 7 μm. In this respect, the patentee was referring to the fact that the copper foil, i.e., the copper layer, that would be transferred to a pre-preg during a laminating process, could be entirely built up by a vapor deposition process. However, building up the copper by such a method would be expensive and time-consuming. Electrodeposition is a much less expensive process for building up a copper foil layer.

In the '620 patent, the "ultra-thin copper foil layer" is built up by an electroplating process and by an electrodeposition process. The comments by the patentee of the '620 patent in column 4, lines 19-24 indicate that the transferable copper layer could be built up solely by a vapor deposition process instead of the two (2) electroplating processes discussed in the patent. In this respect, the '620 patent does not teach vapor-depositing a thin protective layer of copper (having a thickness of about 50 Å to 10,000 Å) onto a release layer and then thereafter, electroplating copper thereon.

With respect to the Examiner's reference to column 5, lines 60-66, it is here where the patentee of the '620 patent describes the two (2) plating steps, i.e., two (2) electrodeposition steps, for building up the copper onto the release layer. Again, it does not teach a component having a thin protective layer of copper formed by a vapor deposition process and a thicker layer of copper thereon formed by an electrodeposition process.

In summary, Applicants respectfully submit that neither the '652 patent nor the '620 patent teaches, suggests or show the component as set forth in the claims.

For the foregoing reasons, Applicants respectfully submit that the claimed component having a vapor-deposited layer of copper on top of a release layer and an electrodeposited layer of copper on the vapor-deposited layer of copper is not shown in either of the cited references. As indicated above, the '652 patent does not teach a metal carrier substrate or the problems inherent in releasing metal from a metal substrate. There is simply no teaching as to a separation release layer for a metal substrate and metal built-up thereon. The '652 patent teaches two (2) layers of electrodeposited copper on a release layer. The reference in the '652 patent to vapor-depositing copper on the release layer refers to building up the entire thickness of copper on the release layer by vapor deposition, and does not teach a thin vapor-deposited layer covered by an electrodeposited layer of copper.

For the foregoing reasons, Applicants respectfully submit that the claims in their present form are distinguishable from the cited references, and favorable action is therefore respectfully requested.

Respectfully submitted,

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I hereby certify that this correspondence (along with any paper referenced as being attached or enclosed) is being deposited on the below date with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to MAIL STOP NON-FEE AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: November 3, 2003

Christine Goellner